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THE CONTROL OF ARRHYTHMIAS OCCURRING DURING OPERATION UPON THE VALVES OF THE HEART: EXPERIMENTAL AND CLINICAL OBSERVATIONS

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IN previous reports, we^{1,2} have described two technical procedures in experimental animals by which division of the aortic valve can be accomplished, with a view toward developing a surgical approach to the treatment of valvular stenosis in human patients. During the development of the second technic,² using large adult mongrel dogs, it was noted that numerous disturbances in cardiac rhythm occurred incident to manipulation of the heart and instrumentation of the valves. It is well established that a damaged myocardium is more irritable than a normal one and that serious arrhythmias, such as ventricular fibrillation, may occur during operation upon a heart which has been injured by rheumatic fever, congenital defects, disease of the coronary arteries or pericarditis. An effective means of preventing such a serious complication is essential to the successful surgical treatment of valvular stenosis.

EXPERIMENTAL OBSERVATIONS

Described elsewhere in detail, the second method of aortic valvulotomy² in dogs consisted of passing a specially-devised valvulotome through the wall of the left ventricle at the apex, advancing the instrument within the ventricular chamber until its movable blade engaged the free margin of an aortic leaflet. At this point, the leaflet was divided, producing aortic regurgitation. Hemorrhage

From the Department of Surgery, Medical College of South Carolina. Presented by motion picture before sixteenth annual Postgraduate Surgical Assembly of The Southeastern Surgical Congress, Hollywood, Florida, April 5-8, 1948.

from the ventricular puncture wound was controlled by a purse-string suture which was placed in the apical myocardium prior to opening the ventricle. Disturbances of rhythm were most marked during placing of the purse-string suture, during advancement of the valvulotome through the apical myocardium and during manipulation of the heart incident to tying the purse-string suture. By electrocardiographic recording,² the following arrhythmias were noted with greatest frequency:

- (1) Ventricular extra systoles
- (2) Ventricular tachycardia
- (3) Ventricular fibrillation
- (4) Complete disorganization of rhythm.

It is of interest that there occurred a return to normal rhythm in each instance upon discontinuing manipulation and instrumentation of the heart and there were no deaths attributable to arrhythmias per se. This was due most probably to the use of normal healthy animals having no demonstrable myocardial disease. It is quite obvious that an irreversible fibrillation or tachycardia may develop during similar operative stimulation of the heart in human patients having myocardial damage and, as noted by Mautz,³ may be "occasionally the immediate cause of a fatality."

In an attempt to devise a means of reducing the occurrence of the arrhythmias noted above, experimental studies in dogs were conducted in the following manner. With the animals under sodium pentobarbital anesthesia, an area of myocardium was selected at the apex of the left ventricle corresponding exactly to the area in which the purse-string suture would be placed and through which the valvulotome would be passed in performing experimental aortic valvulotomy. A second location was selected on the anterior surface of the right ventricle midway between apex and base. Each area of myocardium was stimulated separately by vigorously delivering, with a blunt surgical instrument, a series of 10 blows each in rapid succession and of sufficient intensity to indent the wall of the myocardium. It was felt that this method of stimulation more closely resembled the stimulus of operative instrumentation than other available means. The method selected, because of the manipulation of the heart required, was found to interfere to a great extent with electrocardiographic recordings. Therefore, results of the experimental stimulation were recorded in many instances by motion pictures in color, utilizing particularly the advantages of slow motion photography.

The resulting disturbances of rhythm consisted in the main of

ventricular extra systoles and ventricular tachycardia. There were no differences in degree or extent of arrhythmias arising from stimulation of either the right or the left ventricle. In a group of 20 animals, the disturbances appeared immediately after each series of blows by the blunt instrument and persisted for a few seconds, disappearing spontaneously when the stimulus was discontinued. The response was uniform in the entire group.

Control of the arrhythmias induced by instrumentation of the ventricular myocardium was attempted by several methods, involving principally the use of procaine (Table I). As described by

TABLE I

METHODS EMPLOYED IN CONTROL OF EXPERIMENTAL ARRHYTHMIAS
1. Topical Procaine
2. Myocardial Infiltration of Procaine
3. Intravenous Procaine
4. Interventricular Septal Infiltration of Procaine
5. Intravenous Quinidine

Barron,⁴ cocaine derivatives have been known for many years to depress cardiac irritability when applied locally. Experimental investigations³⁻⁶ have been largely concerned with the production of arrhythmias by an induction current and their abolishment by topical application of drugs of the cocaine group. Thus, the epicardial application of procaine was the first method employed in this series to control the arrhythmias induced by blunt instrumentation of the ventricular myocardium. Aqueous procaine solution, 5 per cent, was applied topically to the epicardial surface and allowed to pool in the pericardial sac so as to bathe the surface of the heart. Amounts used varied from 2 c.c. to 10 c.c., depending upon the size of the animal. An interval of 5 minutes elapsed before stimulation was begun. In a total of 20 animals, there occurred no appreciable effect on arrhythmias induced in the manner described in 13, while in 7 there was only a slight to moderate reduction in ectopic beats (Table II) as noted by slow-motion moving pictures. This represents an incidence of failure of procaine protection in 65 per cent of the animals.

A second group of 30 animals was studied in a different manner, using a 2 per cent aqueous solution of procaine infiltrated beneath the epicardium and into the myocardium at the point of proposed stimulation. A wheal was raised by sub-epicardial injection of the

TABLE II

REDUCTION IN ARRHYTHMIAS BY TOPICAL PROCAINE		
<i>Degree of Reduction</i>	<i>Number of Animals</i>	<i>Incidence—Per Cent</i>
Moderate	5	25
Slight	2	10
None	13	65
Totals	20	100

solution in amounts varying from 1 c.c. to 5 c.c. according to the size of the heart. In 25 animals, stimulation in the usual manner at the site of infiltration produced no disturbances of rhythm whatever, while in the remaining 5 animals there was a reduction in ectopic activity of 85 per cent to 90 per cent of that which occurred prior to infiltration (Table III). Of interest was the transient

TABLE III

REDUCTION IN ARRHYTHMIAS BY LOCAL INFILTRATION OF PROCAINE		
<i>Degree of Reduction</i>	<i>Number of Animals</i>	<i>Incidence—Per Cent</i>
Complete Abolishment	25	83
Marked	5	17
None	0	0
Totals	30	100

occurrence of disturbances in rhythm during infiltration, apparently the result of stimulation by the needle, which disappeared immediately upon diffusion of the procaine.

Intravenous procaine was administered in 3 animals after determining their cardiac irritability by ventricular stimulation as above. In amounts of 10 mg. per kilogram, injected in an ankle vein, there was no effect whatever on the arrhythmias produced in the manner described. Further injection of larger amounts (15 mg. per kilo) directly into the ventricular chambers of the heart was also ineffective and was followed by ventricular fibrillation in one case which resulted in an immediate fatality.

In the fourth group of 3 animals, an attempt was made to infiltrate with procaine the interventricular septum in an effort to determine what effect, if any, would result from local anesthetization of the conduction bundle. The procaine solution (2 per cent) was

colored with methylene blue dye in order that its degree of dissemination within the septal tissue might be estimated by postmortem dissection. A total of 5 c.c. was injected in each experiment. It was believed that in each instance infiltration was probably of sufficient extent to bring an appreciable portion of the bundle fibers into contact with the procaine. The effects of the procedure, as determined by gross observation after stimulation of the ventricular apex in the usual manner, were entirely negative, there being no reduction in the occurrence of arrhythmias produced by stimulation.

Quinidine sulfate was administered intravenously in a fifth group of 4 animals, followed by stimulation of the apex in the manner described. It was found by Allen and his associates⁷ that this form of medication afforded protection against ventricular tachycardia induced by cyclopropane anesthesia and intravenous epinephrine in dogs when given in amounts of 15 mg. per kilogram of body weight. In our series, 10 mg. of quinidine per kilogram was given intravenously with no appreciable effect upon the arrhythmias induced by blunt instrumentation of the ventricular wall. By increasing the dosage to 15 mg. per kilogram, a reduction in ectopic rhythm of about 30 per cent was accomplished. It is to be noted that quinidine in amounts as great as used in these experiments is far in excess of the dose which is generally considered safe in human patients.

Comment. Results of this investigation tend to indicate that myocardial infiltration of the area from which ectopic stimuli arise constitutes the only reliable method of using procaine as a protection against arrhythmias occurring during operations upon the valves of the heart. Procaine solutions applied topically, so as to bathe the epicardial surface, were disappointing in their degree of effectiveness, although in 35 per cent of the animals there occurred a slight to moderate reduction in ectopic activity induced in the manner described. The complete failure of intravenous procaine to afford protection against disturbances of rhythm, although investigated in only 3 animals, is in keeping with results obtained by Stutzman and his associates.⁸ These investigators found that procaine in doses of 16 mg. per kilogram of body weight, administered by either intravenous or intracardiac injection, was uniformly unsuccessful in reversing ventricular fibrillation in dogs induced by intravenous epinephrine during cyclopropane anesthesia. Regarding the fourth method of procaine protection, interventricular septal infiltration, the results obtained in this study are inconclusive because of the uncertainty of the extent of the procaine dissemination and because of the small number of animals investigated.

Intravenous quinidine sulfate afforded protection of only mod-

erate degree against arrhythmias in the 4 animals so treated. To obtain even this degree of reduction, the dosage employed was far greater than that which is considered applicable to human patients. It was found by Allen and his co-workers⁷ that intravenous quinidine sulfate in doses less than 15 mg. per kilogram of body weight failed to protect against ventricular arrhythmias in dogs receiving epinephrine while under cyclopropane anesthesia. Mautz⁸ was able to protect against ventricular tachycardia and ventricular fibrillation occurring in dogs after coronary artery ligation by oral doses of quinidine sulfate as large as 30 mg. per kilogram of body weight given twice daily. He stated no ill effects were noted in the animals after such large dosage.

CLINICAL OBSERVATIONS

Eight patients have been operated upon for mitral stenosis due to rheumatic heart disease. Detailed observations of these cases will be reported subsequently. Of the group, 2 deaths have occurred, one 10 hours after operation, the other on the third post-operative day. In neither instance was death due to an irreversible arrhythmia and in none of the cases did a serious disturbance of rhythm occur during operation. Approach to the mitral valve with a specially-devised biting valvulotome was made through the apical area of the left ventricle in 4 cases, while in 3 patients the instrument was passed into the heart through the appendage of the left atrium. In one patient, both routes were utilized, the initial attempt at locating the valve through the auricular appendage being unsuccessful. Two of the patients had chronic auricular fibrillation at the time of operation which did not change in character during the procedure.

As a means of protection against serious arrhythmias during operation, a definite routine has been followed in each instance. Inasmuch as both topical procaine and quinidine sulfate afforded definite, though limited, protection in experimental animals, each has been utilized in addition to myocardial infiltration of procaine. To date, each patient undergoing operation has received quinidine sulfate by mouth, after an initial test dose, in amounts of 3 grains every 4 hours for 24 to 48 hours prior to operation; on the morning of operation, 5 grains has been given orally about 2 hours before the procedure is undertaken. When the thorax has been opened and the pericardium incised, 5 c.c. to 20 c.c. of 2 per cent procaine solution is applied locally over the entire surface of the heart and allowed to pool in the pericardial sac. Infiltration of either the ventricular or auricular myocardium with 5 c.c. to 15 c.c. of 1 per cent procaine solution is accomplished next, depending upon the method

chosen for opening the heart. The area infiltrated is of sufficient extent to include both a purse-string suture and an incision through which the valvulotome is passed.² During manual displacement of the heart into the thoracic wound so as to expose its apex for the ventricular approach, numerous ectopic beats, principally ventricular extra systoles, have occurred. Such disturbances of rhythm incident to torsion of the heart have been affected but little by the previously-applied topical procaine. Once the heart has been displaced and is held by the operator's hand in the position desired, a short rest period has resulted in restoration of normal rhythm in each instance except in the 2 patients having auricular fibrillation; in neither of these was there a change in the character of the fibrillation during operation. On exposure of the apex, procaine infiltration of an avascular area of the left ventricular myocardium is carried out. A purse-string suture of catgut is placed in the procainized myocardium and the valvulotome inserted into the ventricular chamber through an incision made within the confines of the purse-string suture. In the experimental animals, placing the purse-string suture without previous myocardial infiltration of procaine occasioned serious disturbances of rhythm which were accentuated further by introduction of the valvulotome. Of the 5 patients in whom the ventricular approach was selected, arrhythmias did not occur during this part of the operation after intramural procaine injection. On the other hand, intracardiac instrumentation incident to locating the stenotic valvular orifice has been accompanied by both ventricular extra systoles and ventricular tachycardia in 3 of the 5 patients. These disturbances were temporary in each instance and disappeared promptly upon removal of the instrument.

Of the 3 patients in whom the heart was entered through the auricular appendage, auricular fibrillation was present at the time of operation in one. No change in the character of the rhythm occurred during operation. In the other 2 cases, normal rhythm was present on opening the thorax. During procaine infiltration of that portion of the appendage in which the purse-string suture was to be placed, transient fibrillation of the auricles was noted due to stimulation by the injecting needle. The arrhythmias disappeared immediately as the procaine solution was infiltrated into the auricular myocardium and did not recur during intracardiac instrumentation.

SUMMARY

Clinical and experimental observations concerning the control of arrhythmias during operation upon the mitral and aortic valves of the heart are presented. Of the various methods of using procaine,

the most effective is intramural infiltration of the site from which ectopic stimuli arise during operation. A routine adopted to reduce arrhythmias to a minimum in human patients undergoing operative treatment of mitral stenosis is described.

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PROBLEMS IN THE DIAGNOSIS AND TREATMENT OF KIDNEY STONES

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THE problem of diagnosis of kidney stones in the average case is relatively simple, whereas in some instances it may be quite difficult.

In the acute case of renal colic, a tentative diagnosis can be made from the history. The sudden onset of pain in the renal area that radiates downward and forward along the course of the ureter, to the bladder, testis, ovary or vagina, often associated with nausea and vomiting, is characteristic. The presence of fresh red blood cells practically clinches the diagnosis. Further corroborative evidence is the statement that the patient has previously passed a stone.

Acute renal colic must be differentiated from acute appendicitis, gallstone colic, perforation of a gastric or duodenal ulcer in a patient with a history of ulcer. Intestinal colic may at times be confusing. Failure to recognize *tabes dorsalis* has resulted in an unnecessary operation for kidney stone.

At times an appendectomy or gallbladder operation is done without relieving the patient. Fortunately such instances are rare today. Patients with left-sided symptoms have been treated for colitis or a spastic bowel without relief. An x-ray taken during a subsequent barium enema revealed the presence of a stone in the kidney.

When a patient, with known gallbladder disease and renal calculus, is seized with severe abdominal pain, fever, nausea and vomiting, the problem of differential diagnosis becomes very difficult. A similar problem arises in the patient with renal calculi, and perhaps a history of the previous passage of stones, who develops symptoms suggesting an acute appendix. It may tax one's diagnostic ingenuity to make the differentiation, lest one overlook an acute appendix or an acute gallbladder.

If after due consideration doubt may still exist, I believe an abdominal operation should be carried out, lest the patient develop a fatal peritonitis.

Stone in the kidney during pregnancy may give rise to severe symptoms. The presence of the stone is frequently overlooked because the symptoms are erroneously attributed to the pregnancy.

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This is especially true of the patient who has pus in the urine when a diagnosis of pyelitis is made.

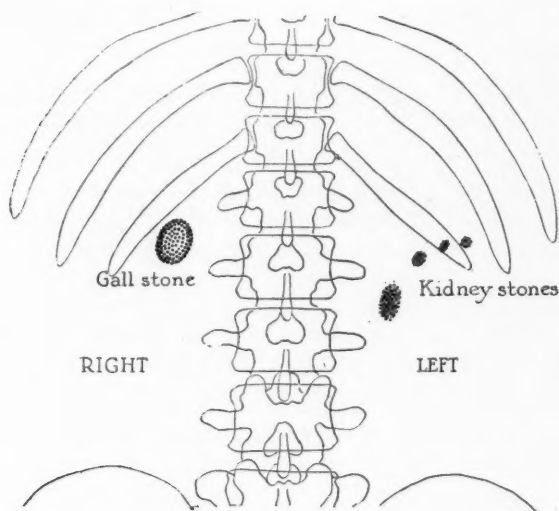


Fig. 1. Single gallstone. Multiple stones in left kidney.

The patient with chronic backache, urinary symptoms, and perhaps the presence of a few pus cells in the urine frequently consults the physician, believing he has a kidney stone. If a stone is present, there is always the possibility that it is silent and not the cause of the backache. Osteoarthritis is frequently the cause of pain in the kidney area and is frequently discovered on routine x-ray examination. It is the cause of chronic backache many times, which is attributed to the kidney. In patients with chronic backache, erroneously attributed to the kidney, and when x-rays are negative for stone, a lateral film should be made to rule out a herniated disc. In a few instances the so-called kidney pain is due to a neuritis.

In many of these cases an accurate analysis of the character, severity and radiation of the pain is most informative.

The patient with a retrocecal appendix may present the clinical picture of renal or ureteral calculus, especially if red blood cells are found in the urine. The red blood cells are due to the attachment of the retrocecal appendix to the ureter.

Pain in the kidney, wrongly ascribed to stone, may be due to lesions in the gynecologic tract, such as endometriosis, as well as various lesions of the fallopian tube, ovary, or uterus.

Pain in the renal area due to chronic prostatitis and chronic seminal vesiculitis is frequently overlooked. If the x-ray is negative, a



Fig. 2. Stone in right kidney. Was at first confused with foreign body in colon.

diagnosis of radio-opaque stone has been made. In others a diagnosis of stricture of the ureter is made and a long course of ureteral dilatations has been carried out without result as far as the backache is concerned. The possibility of pain in the renal area being due to chronic prostatitis and seminal vesiculitis must be constantly borne in mind.

The kidney at times may be the seat of more than one lesion. Although the diagnosis of stone is obvious, the kidney may be the seat of another lesion, such as a tumor or tuberculosis, and a nephrectomy must be done. This emphasizes the need for a pre-operative study of the opposite kidney even if only a removal of the stone is contemplated.

Fortunately stone and polycystic disease of the kidney is rare and, as a rule, presents no special problem in the diagnosis. It does present a difficult problem in the management of the individual case.

The patient with a large stone in the kidney with hydronephrosis may present himself with a severe persistent hematuria. The hema-

turia is not necessarily due to the stone, but may be due to tumor or tuberculosis in the opposite kidney. Not very infrequently, the



Fig. 3. Rare shape of renal calculi. Compare with fig. 4.

hematuria is due to a tumor of the bladder, or a lesion of the prostate such as enlargement or carcinoma.

The patient with a typical history of renal colic and a negative roentgen film presents a problem in diagnosis. Because the film is negative, a diagnosis of renal colic due to stone is not made in spite of the fact that the clinical picture is that of acute renal colic.

It is well to bear in mind that there are three possible sources of error.

1. In a small number of cases the stone is radio-opaque.
2. The stone may lie over a transverse process or over the bony pelvis and hence its presence is overlooked.
3. In an occasional case the patient has passed the stone before the film is made.

In a certain number of instances in which the clinical diagnosis of stone seems obvious, and the film is read as negative, the patient subsequently passes a stone. Critical rereading of the films after the patient brings in the stone permits one to find a previously unrecognized stone shadow.

Renal and ureteral calculi can be demonstrated in about 95 per cent of the cases. In the small group in whom the x-ray films fail



Fig. 4. Retrograde pyelogram. Stones were found in a cystic cavity.

to show a stone, the intravenous urogram is of value in that it may show a filling defect in the renal pelvis and thus establish the diagnosis. The diagnosis based on this filling defect has certain possibilities of error, since the filling defect may be due to a blood clot or debris. If a retrograde pyelogram has been made, the defect may be due to air injected with the media used to make the pyelogram.

At times the renal area shows no stone shadows. Careful reading of the films will show shadows in extrarenal areas that are by their configuration compatible with kidney stones. Shadows compatible with renal calculi may be found in the iliac fossae. Their anomalous position is the result of rupture of a thin-walled hydronephrotic sac with superimposed infection.

The presence of a stone in an ectopic kidney is overlooked when the shadows are seen in the iliac fossae or within the bony pelvis, i.e., over the sacrum.

The presence of multiple stones in a horseshoe kidney is worthy of careful study, especially when a heminephrectomy is contem-

plated. Careful plate reading is necessary so as not to overlook stones in that part of the isthmus that is to remain.



Fig. 5. Opaque stone in pelvis visualized with retrograde pyelogram.

In the tabetic patient who has a renal stone, the problem may arise as to whether the attacks of pain are due to the kidney stone or to tabetic crises. Increase in the size of the stone, evidence of obstruction, the onset of infection, and gross hematuria, should aid in the differential diagnosis and the need for operation.

Calcified glands in the renal area present no serious problem. They are quite characteristic in their appearance and they change their position in the films taken during the course of the urologic study.

Although exceedingly rare, a mole on the back, which casts a shadow in the renal area, has been mistaken for a renal stone. I have seen this occur on several occasions.

TREATMENT

Non-Operative Treatment

1. *Acute Renal Colic.* Acute colic will usually respond to hot moist packs over the kidney and to hypodermic injections of mor-

phine. If the patient has rapidly recurring attacks of colic due to obstruction at the ureteropelvic junction or has a total block, the



Fig. 6. Filling defect not due to stone.

stone should be dislodged by the ureteral catheter. As a result of catheterization, the stone may be rotated on its axis and drainage re-established. The catheter may be left in place, establishing urinary drainage. This gives time for complete clinical study.

Operative Treatment

1. *Cases in Which Operation Is Urgent.* In a certain number of cases an operation cannot be avoided. These cases fall into the following groups:

- (a) Anuria.
- (b) Acute septic process.
- (c) Severe renal bleeding.
- (d) Repeated attacks of severe renal colic.

The presence of anuria calls for immediate treatment. If the stone is impacted in the uretero-pelvic junction, it may be dislodged by a ureteral catheter. Anuria due to stone in a patient who has had a previous nephrectomy calls for prompt treatment.

The patient with acute septic manifestations in the form of chills,

fever, sweats due to severe infection of the kidney should be operated upon as soon as possible.

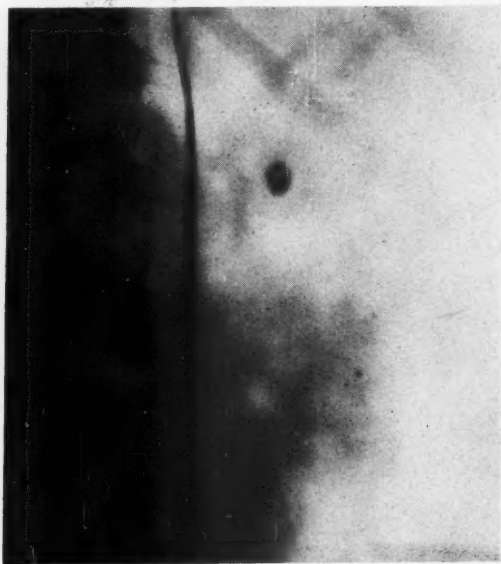


Fig. 7. Small stone in inferior calyx.

In rare instances, the patient may be admitted to the hospital with a severe secondary anemia due to recurring attacks of bleeding and the passage of clots. It may be desirable to give a blood transfusion before the patient is operated upon.

The patient with repeated attacks of severe colic at frequent intervals, so that he is incapacitated and cannot carry on with his usual occupation, must be operated upon.

2. *Cases in Which the Indications are Not Urgent.* The question of whether or not the patient should be operated upon is often a difficult one, and can be answered only after a careful study of each case. The final decision rests upon the clinical judgment of the surgeon.

Among the factors to be carefully considered in each case are the following:

1. Degree of pain, discomfort or disability caused by the stone.
2. The presence and severity of infection.
3. The extent of obstruction produced by the stone.



Fig. 8. Coral shaped stone in kidney pelvis.

4. Stationary or progressive character of the condition.
5. Functional status of the two kidneys.
6. The possibility of recurrence.
7. The probable damage to the kidney which would be caused by the operation as compared with that to be expected from the stone, if allowed to remain.
8. Age and general physical condition of the patient.

SMALL STONES

The need for an x-ray film just before operation is evident in cases of small stones in the pelvis. In cases in which a stone is very small and apparently impacted in the uretero-pelvic junction, a roentgen film should be taken before the operation is begun for the reason that in an occasional case the stone, after having been in its location over a period of observation, suddenly starts its way down the ureter and hence operation on the kidney would be successful.

I should also at this point like to stress the importance of taking a film with the kidney exposed in the loin, especially in multiple small stones, so as to be certain a stone or a fragment of a large stone does not remain behind, since either of these two conditions may be the cause for so-called recurrences.

There are many small stones that pass of their own accord. Small stones lying in the inferior calyx not producing symptoms, i.e., back-

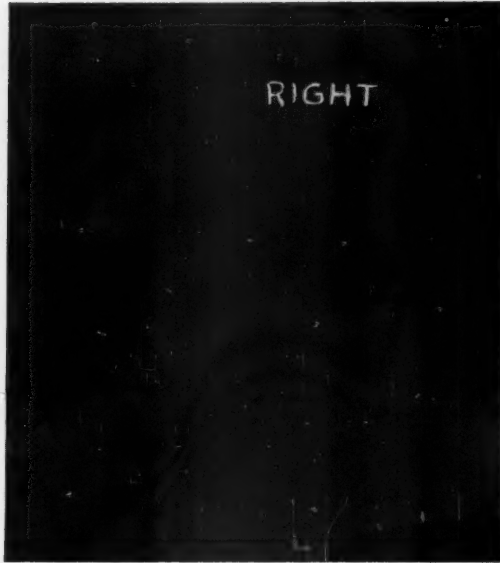


Fig. 9. Kidney stones of unusual shape and location.

ache, renal colic, and unaccompanied by infection may be allowed to remain. They should be examined with x-ray and intravenous pyelogram once a year. If they show no tendency to grow a policy of watchful waiting is in order. If the stone shows a tendency to grow and there is evidence of infection and obstruction, it should be operated upon.

STONES TOO LARGE TO PASS

The majority of kidney stones fall in this group. They vary in size from the pelvic stone, 1 or 2 cm. in diameter, to the large branched stones that fill the pelvis and calyces and often encroach upon the kidney substance with more or less destruction of renal tissue.

Stones in the pelvis too large to pass should be removed, especially if the patient has recurring attacks of colic, if hydronephrosis is present, when pus is present in the urine, and especially if the stone shows a tendency to increase in size.

These stones can be removed through a pyelotomy incision without damage to the kidney.

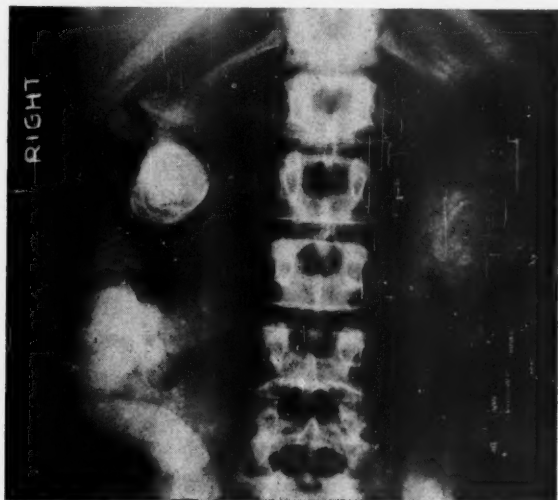


Fig. 10. Bilateral stones in a horseshoe kidney.

STAGHORN STONES

The presence of large branched stones may be discovered on routine physical examination. They have reached their large size without causing symptoms or any inconvenience. In many of them renal function is good and infection may be slight or even absent. Their removal usually involves more damage to the kidney than does the removal of large round stones or multiple small stones through a pyelotomy incision. In some instances they can be removed through a pyelonephrotomy incision instead of a bisection of the kidney.

Attention has been called to the fact that many of these patients live to a ripe old age and die of some intercurrent disease. The point has been made that had they been operated upon, their mortality might have been higher from postoperative complications, such as pneumonia, pulmonary embolism, etc. The fact of recurrence should be considered, and as a result, the patient might be worse off had he not been operated upon.

On the other hand to allow them to remain is unwise since they may lead to progressive renal destruction by pressure atrophy and infection. When severe infection is present, a potential focus of infection remains, which may tend to affect the opposite kidney.

UNILATERAL RENAL AND URETERAL STONE

When the patient has a stone in one kidney and a stone in the opposite ureter, the stone in the ureter should receive attention first.

The incidence of spontaneous expulsion of ureteral stones is relatively high. The patient should be kept under close observation unless there is an acute emergency. Forcing fluids and alkaline diuretics aid in the movement of stone down the ureter.

Removal of ureteral stones by cystoscopic manipulation is successful in a large number of patients. Cystoscopic treatment is not necessary if the stone is small, if it tends to progress down the ureter, if there is no or only slight evidence of hydronephrosis. If cystoscopic manipulation is followed by chills, fever and sweats, it is not to be repeated.

The removal of ureteral stone with various "stone extracting devices" is not entirely free of danger, since cases have been reported where there has been rupture of the ureter with urinary extravasation.

The stone in the ureter should be removed by extraperitoneal ureterotomy under the following conditions: (1) If it is obviously too large to pass, (2) If it remains stationary, (3) If there are frequent attacks of colic, or (4) Increasing obstruction and infection, (5) If the roentgen film shows increase in the size of the stone.

After the stone in the ureter has been removed, one may then proceed with the surgical removal of the stone in the opposite kidney.

BILATERAL CALCULI

The three important questions that present themselves in every case of bilateral calculi are:

1. Whether to operate at all.
2. Whether to operate on both kidneys at one sitting.
3. Which kidney to operate on first.

Where anuria is present attention to its relief is paramount. If due to a stone in the ureter or an impaction at the ureteropelvic junction, relief by ureteral catheterization should be attempted at once. This allows ample time for a detailed study of the case. The relative function of the kidneys, the presence or absence of infection, and the degree of obstruction are important in arriving at a final decision.

Whether to operate or not in bilateral cases is a decision that

must be determined for each case. The fact that they tend to recur in a large number of cases should be given careful consideration. The inconvenience they cause the patient, the degree of infection, the extent and amount of progressive degeneration they cause in the kidneys should all receive careful consideration.

With the use of the new antibiotics there may be a change in our attitude.

Fortunately in most cases of bilateral stones, one is larger than the other. When one stone is large and occurs in a relatively functionless kidney and the opposite stone is small, the usual procedure is to operate upon the least involved kidney. One also has a good impression of the kidney should nephrectomy be decided upon for the other kidney. If the more diseased kidney is operated upon first, and the opposite one becomes blocked, anuria may develop. This may occur before the patient has recovered from his first operation and hence complicates the situation.

Sepsis in the more involved kidney may require nephrectomy.

HEAD INJURIES

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THE program committee of your society suggested the subject for this paper because of the large number of persons injured in automobile accidents, and because a great percentage of those seriously injured have some degree of head injury. The following statement was made by the National Safety Council: "More Americans were killed or injured in automobile accidents during last year than in all of the battles of World War II." To break this down further, during the 20 minutes I am speaking, 46 persons will be injured in automobile accidents, 4 persons will be permanently crippled, and one out of this group will be a fatality. A large percentage will have some degree of damage to their brains. All of you will be called upon during the coming year to treat some of these patients. Some of you have more skill and interest in treating these cases than others have. Unfortunately, all of these head injuries do not happen on the doorstep of a neurosurgeon, who, because of his training and equipment, wishes to accept the responsibility of handling such cases. When the neurosurgeon tells the operating room to prepare for an intracranial operation, it is not a historic event in his hospital. For the neurosurgeon to make several burr hole openings for exploration involves less effort on his part and less risk to the patient than does the removal of an interval appendix by the general surgeon in a thin individual.

I can see by the expressions on some of your faces that you are certain you are in for another of those familiar theme songs that go like this, "Send them to me, they're too tough for you." I assure you I have made a sincere effort to keep this paper out of that group.

Any surgeon treating head injuries should have the following minimum equipment: a perforator, a burr, an adequate suction apparatus, an electrosurgical unit, silver brain clips, and a lighted brain retractor. Fibrin or Gelfoam with Thrombin should always be available.

In cases where the presence of a space-consuming hemorrhage is strongly suspected, air studies should be done in addition to trephine exploration when the latter fails to reveal a clot. If you are not set up to do air studies, select a neurosurgeon near your locality and have at least a telephone acquaintance with him, so that you can call him about the patient who is not doing well. Don't just call and

say, "Doctor, the patient is not doing well; I would like you to come over and see him." Have the temperature, pulse, blood pressure, respiration, and state of consciousness recorded hourly on a suspected head injury. Make a note yourself at least every 8 hours regarding the size of the pupils and their reaction to light, evidence of facial or extremity paralysis, and the state of consciousness. You will find that most patients, after a few hours, will level out and fall into one of the 4 types of concussion adequately described by Woodhall.¹ A change from the base line indicates that it is time for you to call your neurosurgical consultant and give him the above information. He will then be able to tell you whether you should send the patient to him, continue what you are doing, or whether he should come to the patient. It is too often the experience of the consultant to be called to see a head injury of 3 or 4 days' duration and find there are few facts on the chart other than that the patient has been unconscious.

The following 5 points in treatment of head injuries will be made, emphasized, and illustrated by actual cases.

- (1) Replace blood loss and supply oxygen through a clear, dry airway.
- (2) Take meticulous care of scalp lacerations.
- (3) Reevaluate head injuries in regard to the presence of a hematoma at least every 8 hours.
- (4) Make diagnostic burr openings if there is any question of a hematoma.
- (5) Graft all dural defects in compound fractures.

The following 2 cases will illustrate these 5 points:

A 20 year old soldier walked into the field hospital on 8 June 1945, during the closing days of the Okinawa campaign. He was suffering with a scalp laceration in the left occipital region. Twelve hours before admission, he had received a glancing blow from a shell fragment, which inflicted the scalp laceration. The impact threw him to the ground and caused an abrasion on the left frontal region. He was unconscious for only 5 to 10 minutes, but still had a headache at the time of his admission to the hospital.

Examination showed a well developed, well nourished, 20 year old, alert soldier in no pain. There was a laceration 8 by 4 cm. in the left occipital mastoid region and a scalp abrasion over the left frontal region. The pulse was 80, respiration 16, blood pressure 110/75, and the hemoglobin was 90 per cent. Neurologic examination was negative. Roentgenograms of the skull showed no evidence of fracture.

In the operating room, under local anesthesia, the scalp laceration was debrided and irrigated with normal saline. There was a chip off the occipital bone. A dirty, ragged laceration was converted into a clean, well approximated surgical wound. The patient walked to the ward in excellent condi-

tion. The first indication that this was more than a scalp laceration was an unusual symptom to say the least. Twelve hours following the operation, the patient got up from his bed, urinated on the patient in the next bed, and with apparently little concern, got back in bed and resumed his sleep. On one occasion during the day the patient was incontinent. He was slightly irritable, yawned frequently, and responded in a surly fashion to the nurse's questions.

Twenty-four hours after injury, the patient became difficult to arouse, but when aroused would answer questions, yawn frequently, and show a desire to return to sleep. The pupils were equal, myotic, and reacted sluggishly to light. There were no localizing sensory or motor signs. All extremities moved equally well in response to painful stimuli. The pulse was 68, respiration 16, blood pressure 130/80. The only neurologic findings were areflexia and drowsiness. A lumbar puncture revealed a pressure of 360 mm. of water. An hour later the reading was 240 mm. of water. The fluid had a slightly bloody tinge on both occasions. The discrepancy in the reading of the two lumbar punctures was probably caused by the patient's not being completely relaxed when the first was taken. Because of the increased drowsiness and rise in spinal fluid pressure following the lucid interval, we thought that this patient had an expanding intracranial lesion. The possibility of a posterior fossa hematoma was considered, but because of the rarity of this lesion and the fact that he had an abrasion on his left forehead, we felt that the more common locations for a traumatic hematoma should be explored first.

The patient was returned to the operating room 24 hours after admission, and, under local anesthesia, the frontal area on the left was explored by making a burr hole and then opening the dura. No extradural or subdural hematoma was found. In a similar manner the right frontal and posterior parietal regions on both sides were explored and found to be negative. There was no pulsation of the brain in any of these four locations.

Following the administration of 100 c.c. of 50 per cent glucose, there was marked improvement in the patient's state of consciousness. As a result of this improvement, the reopening of the recent laceration for exploration of the posterior fossa was further delayed. I stated earlier that head injuries should be reevaluated at least every 8 hours. This cannot be done too frequently, as will be illustrated. One hour after returning to the ward, the patient lapsed into a deep coma with irregular respiration, areflexia, pinpoint pupils, pulse 50, and blood pressure 180/90. There were still no localizing signs.

He was returned to the operating room for posterior fossa exploration. The original laceration was reopened and a burr hole was made in the occipital bone. This opening was enlarged with a rongeur. The dura was found to be very tense. When the dura was opened, approximately 30 c.c. of dark blood was expelled under pressure. Following this, the brain began to pulsate and there was a marked improvement in the patient's condition. His state of consciousness and circulatory picture rapidly improved. The galea and scalp were closed over the open dura with two layers of silk. Openings made in the dura for evacuating extradural or subdural hematomas are the only exceptions to the rule of always closing the dura. The patient was returned to the ward in good condition. He could then be aroused easily. The postoperative course was uneventful. On the twelfth postoperative day, this soldier was evacuated as an ambulatory patient, and his neurologic examination showed no abnormalities.

This case emphasizes the necessity for the meticulous care of scalp lacerations, the importance of reevaluations, and the necessity for multiple diagnostic burr openings in some cases. Unconsciousness, regardless of how slight, a lucid interval, and loss of consciousness put the burden of proof on the surgeon to rule out a space-consuming hematoma. If the lesion is not found by burr openings, air studies should be done.

The following case will illustrate the remaining two points:

E. F., a 6 year old white boy, was admitted to the Lynchburg General Hospital on March 8, 1948, one hour after being kicked in the right forehead by a mule. The child's father gave the following history: Immediately after the blow, the boy said that he was not hurt and did not need to go to a doctor, despite a large, compound, depressed fracture in the right frontal region. The father stated that the boy was conscious for 30 minutes following the accident, but just before he arrived at the hospital, he became unconscious. Examination showed a well developed, well nourished, 6 year old lad in a deep coma. Respirations were 40 per minute and the pulse was 120. The systolic blood pressure was 50, and no diastolic reading could be obtained. The left side of the body was in convulsive movements; the pupils were contracted, and there were hyperactive reflexes over the entire body and bilateral Babinski signs. Examination of the chest revealed numerous rales. The patient had a large amount of fluid in the nasopharynx and bronchi. The wound was cleaned with merthiolate and examined with a sterile glove. There was found to be a depressed skull fracture with brain tissue extruding through the wound.

The uninitiated house officer on duty had subjected the patient to roentgenographic examination by the time I arrived. This is mentioned to be condemned, as it was not necessary to take time or to disturb the patient in order to demonstrate an obvious compound, depressed fracture. Roentgenograms of head injury cases should be taken during a lucid interval, if possible. The patient was immediately turned on his abdomen with his head to the side and the foot of the examining table elevated 6 inches. This position was described by Coleman² for use in the treatment of head injuries. Suction was applied through a nasal catheter and an airway was inserted. Oxygen was then administered through a clear, dry airway. A transfusion of whole blood was started as soon as the blood could be cross matched.

The original evaluation was that there was little chance of a space-consuming hematoma, since brain tissue was extruding. The family insisted on immediate surgery, but took the refusal very graciously. The case was reevaluated one hour later and was showing improvement. Hourly evaluations were made during the next 3 hours, each showing a steady, progressive improvement. The patient was placed on 50,000 units of penicillin every 3 hours. Thirty-six hours following the injury, the patient was conscious; the neurologic examination was negative, and there was no evidence of shock. The patient was taken to the operating room and, under ether anesthesia, the scalp was debrided; the depressed fragments of bone were removed, and a dural tear about 3 by 2 centimeters was found. Brain tissue was debrided by suction; a graft from the fascia lata of the right thigh was sutured onto the dura and the wound was irrigated several times with normal saline during the pro-

cedure. The fragments were small and the danger of infection was great; so they were not replaced. Now that we have tantalum with which we can repair such cranial defects, I think it inadvisable to replace small, possibly contaminated fragments. The scalp was closed with 2 layers of silk. The patient had an uneventful recovery following the operation and will return later for a tantalum plate if necessary.

This case illustrates the first and fifth of the points listed: the necessity for replacing blood loss and supplying oxygen through a clear, dry airway, and the importance of grafting all dural tears in compound fractures.

I base this statement upon my experience with 96 dural tears upon which I operated during the Okinawa campaign. In none of these cases did I feel that the closure was satisfactory without the use of a graft. The case in which you are able to effect closure without a graft is the exception rather than the rule. During the latter part of the campaign, the assistant routinely removed a large piece of the fascia lata and muscle from the thigh while we were draping the head. Anyone who has ever had to care for a fungus cerebri will be impressed with the importance of a secure closure of the dura.

In conclusion, I will repeat these 5 points to be remembered in the treatment of head injuries:

- (1) Replace blood loss and supply oxygen through a clear, dry airway.
- (2) Take meticulous care of scalp lacerations.
- (3) Reevaluate head injuries in regard to the presence of a hematoma at least every 8 hours.
- (4) Make diagnostic burr openings if there is any question of a hematoma.
- (5) Graft all dural defects in compound fractures.

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CARCINOMA OF THE BREAST

A Comparative Statistical Study

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REPORTS from the principal surgical clinics of this country would suggest that there is a very general agreement that the best treatment of carcinoma of the breast is radical mastectomy, consisting of the removal of both pectoral muscles with a careful dissection of the axilla followed, as soon as wound healing has been accomplished, by an intensive course of x-ray therapy.

It would probably be agreed that the 5 year postoperative survival rate averages from 40 per cent to 50 per cent.

It would also probably be agreed that those patients having already developed axillary metastatic nodes by the time of operation would average a 30 per cent 5 year survival rate, and those fortunate enough to be operated upon before these nodes became involved, would average a 75 per cent 5 year survival rate.

All of our cancer propaganda is predicated on the teaching that cancer begins as a local condition and should be eradicated while still localized. In other words, failure to cure cancer by surgical removal is due either to its incomplete removal at the local site, or to the fact that cancer cells may have already been deposited in distant parts before the surgical operation.

The fact that there is a considerable percentage of local recurrences after radical surgery suggests that, not infrequently, all cancer cells are not removed by surgery and therefore the value of following surgery with x-ray therapy, with the hope of destroying any cancer cells which may not have been removed from the local site by surgery.

At the present time, in this country, most clinics are reporting an average of 60 per cent involvement of the axillary nodes at the time of operation, and undoubtedly many of these patients have already undiscovered distant metastases.

On the basis of these principles American surgery has been directed these past few years, and it has been usually conceded that progress in the treatment of cancer of the breast, and improvement in its survival rates will depend on the earlier discovery of the lump in the breast and its more prompt and radical removal.

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These have been my fixed opinions during the past years. There have been many other uncertain and debatable problems on the surgical horizon. To mention peptic ulcer, carcinoma of the colon and rectum, hyperthyroidism, essential hypertension, hip fractures, herniated discs, thrombophlebitis and phlebothrombosis—even simple varicose veins—all suggest a controversial discussion, perhaps with considerable heat. It would have seemed to me unlikely that much difference of opinion could be aroused on the question of the best treatment of carcinoma of the breast.

However, during the meeting of the International Surgical Society this past September (1947) a week was enjoyed in Edinburgh. At this session, presided over by Professor Learmouth, a paper was presented by Dr. R. McWhirter, reviewing the subject of carcinoma of the breast and its treatment by the Edinburgh group.

At Edinburgh the current practice in the treatment of carcinoma of the breast is: simple mastectomy through the smallest possible incision, followed by a course of intensive x-ray treatments. The estimated 5 year survival rate is 56 per cent of the operable group and 14 per cent of the inoperable group. These estimated 5 year survival rates are considerably better than those reported by any other clinics.

The teaching and practice of the Edinburgh Medical School carries much weight and influence, not only throughout Great Britain and Europe but also here in America. The challenge of this practice of treating cancer of the breast must be answered.

If these estimated 5 year survival rates are confirmed by careful follow-up studies after 5 years have actually elapsed, it would seem that the radical Halsted operation will become a procedure of the past.

However, before discarding this well-established operation it would seem desirable to have readily available the results of follow-up statistics from the larger clinics in this country, and to persuade individual surgeons to keep careful follow-up studies of their own cases, even in smaller groups. For this reason I have collected the following statistics, always having in mind a comparison with this report from Edinburgh. Dr. McWhirter stated at the Edinburgh meeting that 500 new cases of cancer of the breast were reported annually per million women. In a careful study of 2,500 cases, only 6 per cent were lost in follow-up. He stated that 80 per cent of his group had axillary nodes involved at the time of operation, and he reported the following end results:

with radical surgery alone in all cases the 5 year survival rate was
20 to 25 per cent

15 per cent had obvious distant metastases

15 per cent had local inoperable lesions

Of the operable cases,—

with radical surgery alone the 5 year survival rate was 35 per cent
with radical surgery plus x-ray the 5 year survival rate was 44 per cent

with radical surgery alone the local skin recurrences within 5 years were 39 per cent

with radical surgery plus x-ray the local skin recurrences within 5 years were 14 per cent

from 1930 to 1934 only radical surgery was used with a 5 year survival rate of 35 per cent

from 1935 to 1940 radical surgery plus x-ray gave a 5 year survival rate of 44 per cent

from 1941 to 1944 simple mastectomy plus x-ray has been the practice for all cases with an *estimated* 5 year survival rate of 56 per cent.

Of the inoperable cases,—

with radical surgery alone the 5 year survival rate was 0.0 per cent

with radical surgery plus x-ray the 5 year survival rate was 2.5 per cent

with simple mastectomy plus x-ray the 5 year *estimated* survival rate was 14.0 per cent.

Deducting the cases with distant metastases from the total group of inoperable cases, simple mastectomy plus x-ray gave an estimated 5 year survival rate of 24.6 per cent.

Deducting the cases with distant metastases from the total group of operable and inoperable cases (1146 cases) treated by simple mastectomy plus x-ray therapy, the estimated 5 year survival rate was 50.1 per cent.

In respect to the incidence of cancer of the breast in the United States the

1900 census reported 3,500 deaths from cancer of the breast

1920 census reported 6,485 deaths from cancer of the breast, or 15.3 per cent per 100,000 female population

1940 census reported 15,308 deaths from cancer of the breast, or 23.3 per cent per 100,000 female population.

Probably over 16,000 women are dying annually in the United States from cancer of the breast. It therefore seems quite in order to re-evaluate the standard practice of treating this condition, compare results reported from different clinics and to question the progress which has been made in the treatment of this disease, in the face of an apparent increasing death rate.

Prior to the publication of Halsted's first paper on this subject, which was presented before the Clinical Society of Maryland, in Baltimore on April 20, 1894, cancer of the breast was considered incurable, operations were only palliative and were promptly followed by local recurrence.

Bergman reported 114 cases (1882-1887) with local recurrences in 51 to 60 per cent

Billroth reported 170 cases (1867-1876) with local recurrences in 82 per cent

Czerny reported 102 cases (1877-1886) with local recurrences in 64 per cent

Volkman reported local recurrences in 59 per cent.

Halsted's first presentation consisted of:

50 cases operated from 1889 to 1894 followed from 2 months to 3 years and 7 months

100 per cent had axillary node involvement at the time of operation

local recurrence rate up to 1 to 1½ years was 6 per cent.

Halsted in 1907 reported to the American Surgical Association

232 cases operated upon with a hospital mortality of 1.7 per cent

89 patients were living and free of disease 3 to 5 years postoperatively, or 38.3 per cent.

210 cases were followed 3 to 5 years with a 42 per cent survival rate with axillary nodes involved, 30 per cent survived for 3 years

without axillary nodes involved, 85 per cent survived for 3 years.

In 1929 Surgery, Gynecology and Obstetrics published a study of 536 cases from 9 hospitals operated between 1918 and 1920:

20 per cent of the entire group survived free of recurrence 5 years

25 per cent of all primary cases survived free of recurrence 5 years

28 per cent of all operable cases survived free of recurrence 5 years

57 per cent of those without axillary nodes survived free of recurrence 5 years

16 per cent of those with axillary nodes survived free of recurrence 5 years.

Finney reports for a 15 year period 1930 to 1945:

298 private patients treated by radical surgery alone except for 68 who received x-ray therapy and almost all closed without skin grafts.

5 year survival rate was 49 per cent

6 per cent of routine cases developed local recurrences.

Lahey Clinic reports:

Prior to 1936 radical surgery alone with a 5 year survival rate of 38.6 per cent

Since 1936 radical surgery plus x-ray in 228 cases

5 year survival rate 52.0 per cent for the group

cases with axillary node involvement 5 year survival rate 37.0 per cent

cases without axillary node involvement 5 year survival rate 75.0 per cent

62 per cent had axillary nodes involved at time of operation.

Adair reports 277 radical mastectomies plus x-ray therapy:

5 year survival rate 53.0 per cent for the group

cases with axillary node involvement 5 year survival rate 41.8 per cent

cases without axillary node involvement 5 year survival rate 76.8 per cent.

Haagensen (Presbyterian Hospital, New York City) reports:

640 radical mastectomies done in 20 years

5 year survival rate was 36.1 per cent

local recurrence rate was 22.8 per cent.

Harrington (Mayo Clinic) reports:

6558 cases with 47 hospital deaths or a mortality rate of .7 per cent

5 year survival rate was 48.1 per cent in 2757 traced cases

with axillary node involvement 30.5 per cent in 1072 traced cases

without axillary node involvement 75.8 per cent in 1685 traced cases

axillary nodes were involved in 60 per cent of cases at time of operation.

St. Lukes Hospital, New York City, reported from 1922 to 1936:

516 ward cases operated

5 year survival rate was 34.0 per cent or 175 patients

10 year survival rate was 16.2 per cent or 84 patients

axillary nodes were involved in 60 per cent of the entire group

axillary nodes were involved in 34.5 per cent of the 84 cases surviving 10 years

there were local recurrences in 17.4 per cent of the entire group

there were local recurrences in 3.5 per cent of the 10 year survivals.

Author's personal cases:

Total cases operated 138

60 per cent had axillary nodes involved at the time of operation

131 cases had a radical mastectomy-cauterodyne technic followed by x-ray therapy

7 cases had simple mastectomy followed by x-ray therapy

96 radical mastectomies were performed prior to 1943

4 cases lost to follow-up

39 or 42 per cent, survived 5 years

with axillary nodes involved 5 year survival rate was 18.1 per cent

without axillary nodes involved 5 year survival rate was 78.3 per cent

local skin recurrences in 16.3 per cent.

A summary of these statistics might be presented as follows:

	Percentage axillary nodes involved at operation	Percentage 5 year survivals	
		Surgery alone	Surgery plus x-ray
Harrington	60	48.0	48.0
Lahey	62	38.6	52.0
Adair	65		53.0
Presbyterian Hospital	61	36.0	
St. Lukes Hospital	60	34.0	
Finney	45	49.0	
Ramsdell	60		42.0
Edinburgh	80	Simple mastectomy plus x-ray 56.0 (estimated)	

As a result of these statistics the following conclusions are suggested:

First Dr. Halsted's original series of cases was not adequately followed. Although reported as a 3 to 5 year follow-up, many were only followed a few months and others only up to 3 years. At that time cures were thought of in terms of 3 years.

Second The Edinburgh statistics can only be estimates as the cases reported were treated by this method of simple mastectomy and x-ray in the period from 1941 to 1945. More time should elapse before accepting these 5 year percentage survivals.

Third Since the 1929 report of the College of Surgeons, there seems to have been a gradual improvement in the results reported. Today the average 5 year survival rates range from 40 per cent to 50 per cent as against the 20 per cent to 25 per cent reported by the College of Surgeons in 1929.

In this country this has been accomplished by meticulous surgery, followed by careful, intensive postoperative x-ray therapy. The Edinburgh Clinic and their reported results present a challenge to our current practice.

If the Edinburgh statistics can be substantiated in a group of 1,300 cases with 80 per cent axillary node involvement at the time of operation, and a 5 year survival rate of 56 per cent obtained, the whole concept of our thinking on this subject of cancer of the breast must be modified.

I am not ready to accept these statistical reports, but am sufficiently disturbed to bring the matter to your attention. During this visit to Edinburgh in September, 1947, I was impressed with the high quality of surgery there practiced, with the sincerity of the group and with the traditions of that old medical center. Since 1941 cancer of the breast has been treated there by a limited simple mastectomy, followed by x-ray. This is being taught to students and presented to visiting surgeons as the present approved method of treating cancer of the breast.

My plea is to wait for a sufficient time to elapse in order properly to evaluate those statistical percentage rates. I question the accuracy of any statistical mathematical method which will estimate the actual fact of a 5 year survival. The 5 year survival rate of 56 per cent is presented in this series of 1,300 cases, all operated between 1941 and 1944. It would seem wiser to defer judgment on this question until a full 5 year period has elapsed and time has been allowed for careful follow-up.

We, however, cannot be too proud of our own accomplishments in this field. In 1907 Halsted reported 42.5 per cent of 3 to 5 year survivals with a local recurrence rate of only 6 per cent. The more recent statistics of our various clinics I have presented. It seems difficult to get patients to operation in any group before 60 per cent have axillary involvement. For the present it should be our continued effort to reduce this percentage. It should still be our hope to operate on patients before the disease has spread to the axillary nodes. I shall continue to do a careful radical mastectomy, with the removal of both pectoral muscles, a meticulous dissection of the axilla and a closure without grafting. I shall continue to use the cauterodyne throughout the operative procedure and will follow up with x-ray therapy.

The fundamental principles outlined by Halsted in the treatment of cancer of the breast still prevail and tribute should be paid to his memory for the great contribution he made to this subject.

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AN EVALUATION OF THE TREATMENT OF ENDOMETRIOSIS

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TREATMENT of endometriosis is instituted primarily to relieve the patient of pain, abnormal bleeding, sterility, and occasionally intestinal obstructions or bladder symptoms. To do this, one has to keep in mind the age of the patient, the extent of involvement of the particular organs, the patient's marital status, and her desire for children.

Prophylactically, it seems advisable not to do pelvic examinations, tubal inflation tests, curettages, or intrauterine manipulations near menstruation, although most of the patients I have seen with endometriosis had not undergone any of the above procedures. Sampson⁶ proved conclusively in 1924 that endometrial cells can escape through the tubes into the peritoneal cavity, so it seems logical to correct uterine retrodisplacements as a preventive measure; stressing better postpartum attention to retroversions and to the trial of nonsurgical measures for correction; then surgery if these fail. Anything that obstructs the free flow of menstrual fluid into the vagina causes a back pressure into the uterine cavity; thus making it more likely for this fluid to escape through the tubes. Curtis³ refers to stenosis as a predisposing cause either congenital or acquired. Mason⁴ comments on the frequent association of fibroids with endometriosis and feels that it is a contributing factor. Sampson⁶ stressed the danger of inserting radium after a diagnostic curettage and of not giving a castrating dose.

There are many cases reported of endometrial transplants in abdominal scars, and these cases occur often enough to warrant the use of an impervious material to cover the abdominal incision while doing cesarian sections and other operations on the uterus and its appendages. I have seen 6 cases of endometriosis in the abdominal scar, 5 following cesarian sections, and one following a uterine suspension. The needles, sutures, and instruments used in operating on the uterus and its appendages should be discarded before closing the abdomen, because only a few endometrial cells adherent to a needle can be a nidus for an endometrioma in the operative scar. It is possible for an endometrioma to develop in the perineum following a uterine curettement and perineal repair. Nielson⁵ has reported an endometrioma found in the upper vagina of a woman who had injured her vagina with a broken, glass douche-nozzle. Two months

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after the injury she noticed stinging pains and a sensation of swelling. Nielson⁵ believes that the tumor resulted from an endometrial implant in the fresh wound.

We have three major weapons to use in the active treatment of endometriosis: surgery, roentgen ray, and testosterone, all of which may be needed at one time or another during the course of the disease. Most cases come to surgery before an accurate diagnosis is made, but until an accurate diagnosis is made the treatment is necessarily questionable. After the patient's abdomen is opened, a correct diagnosis can be made; but the exact procedure to carry out is frequently very difficult to determine.

The tarry material which is periodically spilled into the pelvis contains blood, tissue debris, and glycogen and is far more irritating and causes tougher and denser adhesions than does any inflammatory reaction from infection. The endometriosis actually grows into the adjacent structures, so that the uterus and its appendages cannot always be separated by following a line of cleavage but have to be severed by sharp dissection. I do not know of many operations that are more difficult to do than those involving an extremely "frozen" pelvis. It is true that these cases are rare; but if encountered (and especially by an inexperienced individual) it is much better to leave them undisturbed, close the abdomen, and give roentgen ray and possibly testosterone. Castration either by x-ray or by surgical removal of the ovaries will cure endometriosis. Occasionally it is impossible to be sure that one has removed every bit of ovarian tissue; and if the patient has a partially obstructing endometrioma of the intestine, she should have a castrating dose of roentgen ray. For some unknown reason most of these women who have to be castrated for an advanced endometriosis do not have as pronounced menopausal symptoms as do those who are castrated for other reasons.

Young women under 30 years of age have comprised a fair percentage of my series of cases and with this group I have been very conservative. In some cases I have removed only one ovary and transplants, and in others I have removed the diseased portions of both ovaries. I recently operated on a girl of 19 with a retroversion who had endometrial implants on both ovaries, the posterior cervix, and in the cul-de-sac. I removed all of the transplants and did a suspension. I advised her upon marriage not to use any contraceptives and to have as many children as fast as she could until she had had all she wanted. It is my experience that pregnancy does not harm these women, and possibly helps them. She is getting small doses of testosterone orally to keep in abeyance any endometriosis that might not have been removed.

I have done artificial inseminations on two nullipara, one married 6 years and the other 8 years, both of whom had previously had palliative operations for endometriosis. One pregnancy resulted, and this patient has been much better since the pregnancy.

Presacral neurectomy, combined with uterine suspension and excision of transplants in the cul-de-sac, seems to be indicated in a small selected group to relieve them of dyspareunia or dysmenorrhea.

Endometriosis of the rectovaginal septum can cause a very serious disability. Cattell¹ advises biopsy to confirm diagnosis. Counseller² cautions that biopsy has a definite risk of producing a rectovaginal fistula. Castration either by roentgen ray or surgery will relieve these women.

Endometriosis of long duration may involve the sigmoid and rectum and much more rarely the small intestine, causing gastrointestinal symptoms or obstruction. If one is sure of the diagnosis, and the obstruction is not complete, surgical castration is to be preferred, as it will relieve the patient quicker than radiologic castration. If the obstruction is severe, a temporary colostomy and castration may be all that is necessary. Rarely should a resection be done. A biopsy and frozen section can be the means of preventing one from mistaking an endometriosis of the intestine for a malignancy.

The treatment of an endometrioma of the urinary bladder is essentially the same as treatment elsewhere. If the patient is a young woman with little or no other involvement, excision of the tumor is best, provided it can be removed without injury to the ureters or urethra; otherwise castration is in order.

Usually when endometriosis occurs in an abdominal scar, on the umbilicus, on the labia, in the groin, or in inguinal or femoral hernias, complete excision is not difficult. I have seen one patient with an endometriosis in an abdominal scar after having been operated on twice by one surgeon and once by another. I was afraid of leaving her with a postoperative hernia; so she was given a castration dose of roentgen ray which relieved her. Wide excision of the endometrioma usually cures these conditions.

It may be of interest to review the cases of endometriosis in my private practice between the years 1938 to 1947 inclusive. There were 101 cases in this group. The series I know is small in comparison with many already reported, and out of the 101 cases only 65 could be contacted in regard to this study. There were 18 patients who had had all of their ovarian tissue removed surgically, which leaves 83 patients who had had some type of conservative

operation. There were 55 hysterectomies: 12 subtotal and 43 involving complete removal of the cervix. Out of the 101 patients operated upon, 44 were left with the possibility of becoming pregnant. Actually 7 women have become pregnant, 2 of whom have had 2 pregnancies. The net result has been 6 living babies and 3 miscarriages.

Of the 65 patients I have been able to follow, 2 have had to have second operations, 2 have had enough pain to warrant x-ray castration, and 3 are taking testosterone intermittently to control pain.

One of the patients upon whom I had done a palliative operation developed an endometrioma in her bladder wall 3 years after the first operation. This endometrioma was resected, and the patient completely relieved. The other secondary operative case originally had a large endometrial cyst which had ruptured. I removed this cyst at the first operation, and 6 months later the patient came back with a marked secondary anemia from uterine bleeding and complained of considerable pain in her lower abdomen. We found at the second operation that there were many adhesions and that the structures in the abdomen still had a brownish tinge. A number of writers have called attention to the irritative character of the contents of these endometrial cysts. At the second operation I removed her uterus and remaining ovary and tube. Her convalescence was uneventful.

Each of the 2 women who were given x-ray for castration had only one ovary left which had become cystic. Three months after the roentgen ray, the cyst had completely disappeared; and the patients were free of pain. Testosterone administered by mouth in the form of linguets metandren controlled their menopausal symptoms and gave them a sense of well being.

One patient who had an extensive pelvic endometriosis and an endometrioma in her rectum came back 18 months after her hysterectomy and surgical castration with pain in her rectum and enlargement of the rectal endometrioma. She was a very nervous woman and lived with her father-in-law who was a doctor. The doctor had given her estrogen against my advise. She was relieved by stopping the estrogen.

I have treated 3 young women with testosterone. These patients had previously undergone ultraconservative operations in order to keep the disease under control until marriage and pregnancy. It is remarkable how much relief they have gotten and how much the contents of the pelvis have loosened up with the disappearance of the cysts. All of these patients were given testosterone in the form of linguets metandren. It has been my practice to give 5 mg. of

the testosterone twice daily for 2 months when first starting the drug; then it is advisable to cut it down to 5 mg. once daily for a period of several months, after which a rest period is suggested and the procedure is repeated. In this way I have avoided hirsutism, hoarseness of voice, and acne in these young women.

It might be interesting to note that in these 101 cases of endometriosis there were associated 3 carcinomas: one of the cervix, one of the fundus, and one primary carcinoma of the left tube. Another patient developed a carcinoma of the sigmoid colon 25 months after I had removed both ovaries, tubes and uterus for a "frozen pelvis." The pathologist, Dr. H. H. Plowden, and I tried to discover some definite connection between the endometriosis and the tumor of the colon but were unsuccessful. There were no deaths in the entire series.

SUMMARY

1. Mention has been made of various procedures which have been of help in the prevention of endometriosis, such as the correction of retrodisplacements, stenosis, and fibroids; the use of an impervious material over the abdominal incision while doing cesarians; and also the practice of discarding the instruments that were used before closing the abdomen.

2. Some far-advanced cases with "frozen" pelves should be treated with x-ray rather than attempting to remove the pathology surgically.

3. It may be advisable that testosterone be used in small doses in the treatment of young women with endometriosis, in order to keep the disease in abeyance.

4. The patient herself should be advised of her condition and of the problems with which she is faced in this connection. This is especially true in the case of young, single women who wish to be married and have children.

5. There are times after palliative surgery when it is preferable to give a castrating dose of x-ray rather than subject the patient to another operation.

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GENITAL MALIGNANCY IN THE FEMALE

ROBERT A. ROSS, M.D., F.A.C.S.

Durham, N. C.

NO ONE is satisfied with the available methods of treating malignancy. This is especially true in the treatment of genital malignancy in the female. The fact that most operators and roentgenologists will vary in their technic from time to time probably proves that all methods, properly supervised, have value and that none is ideal. There is little variation in the salvage figures. The truth is that the treatment of malignancy cannot be based on medical care alone. The extensive program of the Cancer Research Institute reveals the distressing period between first symptom and first medical consultation and the even more tragic period between suspicions and diagnosis and definitive measures, which, in most instances, assures the malignancy a morbid if not mortal handicap. The social status, ignorance, lack of finances, lack of social investigators, the lack of facilities in the generally medically inarticulate, limited hospital bed space, inability to purchase expensive apparatus and elements all penalize the patient and penalize the doctor who, under such conditions, can do only so much. The lowering of the mortality rate in patients with female genital malignancies since the early work of Heyamn, Fegard, Forsell, Kelly, Clark, Burnam, Schmitz and others with x-ray and radium and the operative approach of Schauta, Wertheim and Bonney has not been as remarkable as one would like. We have seen the x-ray voltage gradually increased from thousands to millions, different portals and screening tried, various methods of radium applications used, and more recently with improvements in anesthesia, technic, chemotherapy, selection and supportive measures extensive operative procedures have again been instituted. The chief justification for optimism is that scores of workers are not satisfied with their results and are determined to lower the morbidity and mortality in such patients and are anxious to learn by intelligent application and review.

In a meeting such as this Congress it would seem wise to report one's own efforts directly and indirectly the works of others known to most and available to all. Their work is now a part of medical literature.

There has been moderate improvement in our mortality rates in these malignancies since our reports¹ soon after the opening of Duke University Hospital in 1930. Carter² has reviewed the records of

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53 patients with carcinoma of the vulva and his findings recorded. Thomas, Carter and Parker³ have recently (1947) reviewed the incidence of carcinoma of the cervix. The incidence of fundal malignancy is 5 to 10 per cent and malignancy of the ovary is 10 to 15 per cent of genital malignancy.

Diagnosis. We have repeatedly stated the absolute necessity of multiple procedures to establish or rule out malignancy. A positive Frei test, the presence of Donovan bodies, darkfield and positive Wassermann, the presence of tubercle bacilli or chancroid bacilli and other pertinent data do not rule out the possibility of associated malignancy. Tissue from several areas removed for biopsy examination and curettements are the true criteria. The possibility of malignancy must be kept in mind in all genital lesions. More recently we have had recourse to the Papanicoulau and Traut⁴ type of vaginal smear study. We would like to emphasize that this is a "screen" study. If suggestive findings result we insist on biopsy material and curettements for confirmation. We might consider this in the same

TABLE 1.

Percentages of Error (January, 1947, through February, 1948)

Total number of patients.....	2,353
Total number of malignancies diagnosed by pathology.....	151
Total number of malignancies diagnosed by smears.....	138
Percentage of error by under-diagnosis.....	8.6
Remaining patients (who did not have malignancies).....	2,210
Diagnosis of malignancy by smears.....	33
Percentage of error by over-diagnosis.....	1.5

TABLE 2.

*Total Number Malignancies with Concomitant Vaginal Smears
(January, 1947, through February, 1948)*

1. Squamous celled carcinoma of the cervix.....	118
2. Squamous celled carcinoma of the vulva.....	5
3. Squamous celled carcinoma of the vagina.....	2
4. Adenocarcinoma of the endometrium.....	12
5. Adenocarcinoma of the cervix.....	4
6. Adenocarcinoma of the oviduct.....	1
7. Metastatic adenocarcinoma of the vaginal wall.....	2
8. Sarcoma of the uterus.....	3
9. Metastatic carcinoma.....	1
10. Undifferentiated carcinoma involving oviduct, peritoneum and ovary.....	1
11. Chorionepithelioma.....	1
12. Hodgkin's disease.....	1
	151

TABLE 3.

Summary of Over-Diagnoses by Smears

Patients who had had irradiation for carcinoma:	
Carcinoma clinically; negative biopsy.....	1
Carcinoma clinically; no biopsies.....	5
Carcinoma clinically; pathology of biopsy doubtful.....	1
No carcinoma clinically; negative biopsies.....	6
No carcinoma clinically; no biopsies.....	4
	<hr/>
	17
Other patients:	
Those who had negative biopsies.....	10
Those who have had no biopsies or follow-ups.....	2
Those who had suspicious biopsies; no follow-ups.....	4
	<hr/>
	16
Total.....	<hr/> 33

TABLE 4.

Summary of Under-Diagnoses by Smears

These may be classified as follows:	
Insufficient epithelial elements.....	5
By pathology, these were:	
Squamous celled carcinoma of the cervix.....	4
Adenocarcinoma of the endometrium.....	1
Cancer cells not recognized due to distortion by irradiation.....	3
By pathology, these were:	
Squamous celled carcinoma of the cervix.....	3
Missed by not recognizing cancer cells which were present.....	5
By pathology, these were:	
Squamous celled carcinoma of the cervix.....	3
Adenocarcinoma of the endometrium.....	1
Undifferentiated carcinoma involving the ovary.....	1
	<hr/>
	13

light as the microphoto x-rays of the chest in looking for pulmonary tuberculosis. If suggestive findings are reported further study is necessary. Our findings⁵ have been reported. The following tables record our results. Our errors, equally important, are recorded.

Carcinoma of the Vulva. Carter² recently reported 57 patients with cancer of the vulva, of which 53 were squamous celled and 4 basal celled. Complete treatment was refused by 12. Our salvage was 33 per cent. The ages varied from 3 to 81 years. There were 14 nulliparae and 43 multiparae. Six had had artificial menopause. The

symptoms had lasted from a month to several years. Previous lesions noted were leukoplakia, atrophic dermatitis, kraurosis, eczema, increased pigmentation or recurrent Bartholinitis in 17 patients. Two patients had associated cancer of the cervix. Thirty-four patients had inguinal node involvement and 7 patients had both sides of the vulva involved. Previous treatment varied from ointments and powder to x-ray. Our preferred treatment is x-ray followed by radical vulvectomy and Bassett groin dissection. Recurrence was frequent and slow healing the rule.

From 1944 to September, 1947, 530 new patients with carcinoma of the cervix were treated at this hospital. As formerly stated, we have not been too happy with our results from radiation alone. In an effort to learn more about metastasis and in the hope of salvaging a greater number of patients it was decided to resort to a radical hysterectomy, bilateral salpingo-oophorectomy, excision of a large part of the vagina, dissection of the ureter and ureteral, obturator and iliac nodes together with the fat. This is actually more than the orthodox Wertheim operation. Over 100 patients were subjected to this procedure but only the cervical malignancies, numbering 75, were reported;³ a total of 14.2 per cent of the cervical malignancies. These patients presented malignancies of the cervix falling into Stages I and II, rarely III. In this group were 5 of the so-called "intra-epithelial" carcinoma or "carcinoma in situ" or "Bowens disease." This lesion is of interest to all surgeons or roentgenologists because similar lesions are found in the breast, prostate and skin. We believe that this constitutes a real malignancy and regional metastases.

In clinical Stage I there were 51 patients. In 8 patients who did not have radiation there were inguinal node metastases, or 15.7 per cent, and in 3 patients who had radiation, or 5.9 per cent. In Stage II there was no patient who did not have radiation and in 5 patients who had radiation (23.8 per cent) there was inguinal node metastasis. There were 3 patients in Stage III, all of whom had radiation and 1 (33.3 per cent) had metastasis. Metastases were found in the iliac nodes most frequently (6), obturator nodes next (4), and ureteric nodes (3). There were combinations in 4 instances. The patients who had radiation received from 3,600 to 6,100 mg. hours of radium and from 7,000 to 13,600 R. units of x-ray alone or in combination, depending on the reaction of the tissue and response of the patients.

There was no operative mortality but shock was frequent, morbidity not so great as expected. The postoperative complications were probably due to interference with blood and nerve supply and

were: gangrene of right leg, where both iliac vessels had to be ligated because of hemorrhage, this patient also developed a vesicovaginal fistula, 2 generalized peritonitis which responded to chemotherapy, one wound disruption, one thrombophlebitis, one ureteral stricture, one vaginal hemorrhage, one early and one late intestinal obstruction, neither of which had to have operation, one pyelonephritis, one ureteral stricture with stone. Nine patients developed fistulae, one had ureterovaginal and vesicorectal fistula. One patient had both vesicovaginal and rectovaginal fistula. This patient died 15 months after operation. One patient with ureterovaginal fistula had nephrectomy and cure of fistula. Three patients with fistula healed with ureteral catheterization. Five died 10 to 16 months after leaving the hospital and 15 patients are known to have extensive metastasis.

Pearse⁶ in reporting a series of hysterectomy operations performed at Duke Hospital found 35 patients with carcinoma of the cervical stump and comparing this number with 1,243 supravaginal hysterectomies arrived at a non-conclusive figure at 2.8. There has never been an accurate percentage of stump carcinoma compiled, because the same operator must follow all his supravaginal hysterectomies and not include any other operative carcinoma. Certainly all agree that the cervix should be removed if possible. There is little indication for the term "occasional operator" in a surgical discussion and less indication for such a doctor in present day practice.

Carcinoma of Fundus. We follow the teaching of Healy and his group at Memorial Hospital; we are not satisfied until surgery is done in the treatment of fundal malignancy. There is little difference in the statistics of the men who use radium, x-ray and surgery in any order. There may be technical difficulties if operation is delayed beyond 4 to 6 weeks. On the other hand, there may be a relighting of infection if done too soon. The essayist prefers to use radium at the time of diagnostic curettage, leaving it in 24 to 4800 mg. hours. Then in 5 to 6 weeks doing the operation of complete hysterectomy with bilateral salpingo-oophorectomy. In this disease, as most others, individualization is the sheet anchor of treatment. In some poor risk patients we withhold operation, reluctantly though it be. The association of adenocarcinoma of the fundus with fibroids and hyperplasia of the endometrium is noteworthy. Curettage is necessary for diagnosis, endometrial biopsy will not suffice.

Ovarian Malignancy. The incidence of ovarian malignancy is a bit higher than fundal malignancy and is in the same ratio as for-

merly reported.¹ Carpenter⁷ in a remarkable document reported on 11 hospitals that sent specimens for diagnosis. Of 2,933 surgical specimens received 1,137 (38.4 per cent) were from the female pelvis. The percentage of gynecologic specimens were:

Ovary	322 (28.3%)
Fallopian tube	231 (20.3%)
Uterus	218 (19.1%)
Cervix	193 (16.9%)
Curettements	173 (15.2%)

One is struck with the inverse ratio. It seems incredible that there should be almost twice as many ovaries as uterine scrapings submitted for diagnosis, especially since 78.9 per cent (248) of the ovaries might well be considered a normal manifestation. Encountered at the time of operation. Where there is a suspicious dermoid cyst, rapidly growing tumor of the ovary, an abscess, virilizing tumor, or suspicious malignancy, we urge investigation by surgery. Even where we consider the possibility of a hopeless condition, as in pseudomucinous cyst, adenocarcinoma, we advocate laparotomy in the hope that our diagnoses may be wrong, as is sometimes true. Roentgen therapy has proved disappointing in these conditions.

Complications Following Therapy. Most of the complications result from poor selection of risks, inadequate preparation and over-treatment. Postoperative complications are mentioned elsewhere. It must be remembered that the x-ray certainly and the scalpel, paradoxically, are two edged swords. The x-ray is a destructive agent. All have seen the unfortunate symptoms following x-ray therapy for pruritus vulvae and other benign conditions. It is of unquestionable value in proved malignancy, but there is a tendency to overtreat the hopeless patients and undertreat the more favorable patients. Thomas⁸ has reviewed the complications following radiotherapy of carcinoma of the cervix in our experience and urges that full and adequate dosage be given in the first attempt; the effect is greater, fibrosis is less. Re-radiation is used only for local recurrence. The complication that the patient most easily interprets is alteration of the skin. This may manifest itself in erythema, tanning, telangiectasia and even ulceration. If the patient is psychically prepared for this and is given bland and soothing applications it should not, under present Coutard regime, prove severe. If the patient is adequately prepared for therapy by psychotherapy, transfusions and hemoteric agents she should not develop serious complications. The hemotologic effect is usually immediately evident and is vigorously treated by appropriate measures. If leukopenia develops the treatment is temporarily stopped and later resumed at

longer intervals. A white count of 3,000 or below is the warning. There is usually some vaginitis as evidenced by reddening, edema and cellular degeneration. Repeated douches, manual and prosthetic dilatation and frequent examinations prevent serious adhesions of the vaginal mucosa and stenosis of the canal. Really the important phase in the development of the latter complication is 6 to 12 months after therapy. Frequent follow-up examinations for these and other complications are obligatory. Patients often complain of bladder irritation during or shortly after therapy. Sedations usually give relief. The rarer more serious complications of ulceration, telangiectasia and fistula do not appear until 6 to 12 months later. They are extremely difficult to cure. All measures from fulguration to the combined above and below procedure may be tried. Occasionally ureteral transplantation has been done. Perhaps the most serious urinary complication is obstruction of the ureter. Here it is difficult to determine where infection, malignancy and post radiation reaction separate. Certainly we often find evidence of infection and obstruction and impaired kidney function before therapy and it should be treated, and certainly we should insist on scrupulous follow-up and therapy to prevent as far as possible these resulting complications. Our incidence is about 25 per cent. Intestinal and especially rectal irritation is common. Opiates, warm saline enema and installations of oil and the interruption of therapy give relief. The more serious manifestations again occur in 6 to 12 months. Our incidence 5 per cent. These are stenosis, stricture, hemorrhage and fistula formation. The treatment is immediate and continued dilatation, often under anesthesia, oil to insure regular soft bowel movements. Occasionally a colostomy, temporary or permanent, is required. As in bladder fistulae, rectovaginal fistulae are difficult to close. It is our belief that changes in perivesical and perirectal fat in pelvic malignancy and post radiation therapy causes most of the fibrosis and stricture and the removal of this tissue is of major concern in operations for malignancy. Early mortality is more apt to occur in the patient with pelvic infection. In such patients we use x-ray first and later radium. Pyometra⁹ is a frequent late complication. This can be avoided by frequent and continued sounding of the cervical canal. Occasionally these reactions may necessitate cessation of therapy.

In reviewing the morbidity and mortality, reevaluating our patient's risk and checking on therapy we have arrived at the following conclusions:

1. One member of the department should be directly responsible for all patients with malignancy.

2. Scrupulous study is necessary before any therapy is begun.
3. Individualization in therapy is necessary in each patient. This includes a change in therapy if a patient's response so indicates.
4. Frequent local and systemic checking on all treated patients.
5. The institution of new means of therapy and operation that are basically sound and hold promise for increasing the salvage.
6. Cytologic study of smears is of proved value but should be checked by biopsy material and curettements.

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LUTHER LEONIDAS HILL

ANOTHER "Alabama Student," Dr. Luther Leonidas Hill, Jr., did postgraduate study in England and Europe after receiving his medical training in the United States, just as did Dr. John Y. Bassett, Osler's "Alabama Student." After Dr. Hill received degrees from two excellent medical schools in the United States, he went to London, where he spent six months in Lister's clinic and then toured the continent to visit the best hospitals. From the above it seems that both his medical and surgical training were well above the average of his contemporaries. Dr. Royster, in his tribute to Dr. Hill, had the following to say: "His surgical skill, notable for accuracy and boldness, as with all pioneers; his studious habits and his fine ability to express himself; his high character and unswerving loyalty—all of these have marked Dr. Hill as a man of superior intelligence and ability."

Luther Leonidas Hill, Jr., was born near Montgomery, Alabama, on Jan. 22, 1862, the son of the Rev. Luther Leonidas Hill, Methodist minister, and Laura Sarah Croom Hill, of Greensboro, Alabama. Dr. Hill's grandfather, William W. Hill, who was also a

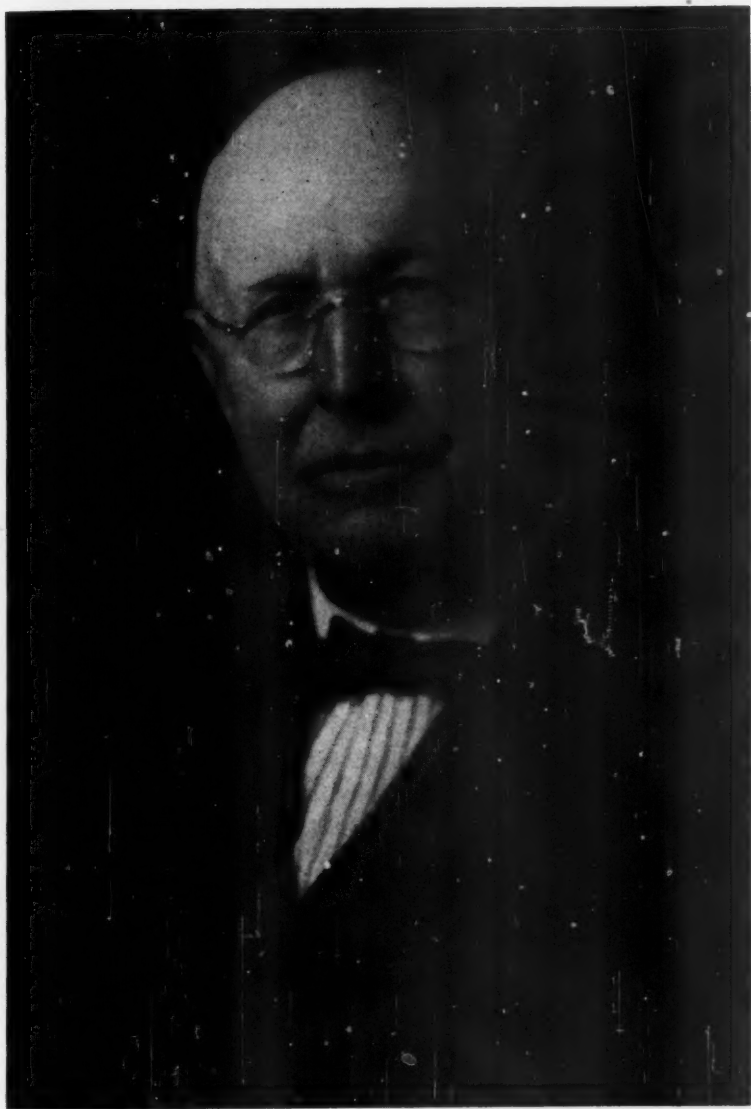
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Read at the Memorial Exercises for Dr. L. L. Hill and the Dedication of the L. L. Hill Medical Library Collection on Dec. 14, 1947.

Methodist minister, moved from Warrenton, North Carolina, to Greensboro, Alabama, in 1829, six years after Luther Leonidas was born. His original American ancestor, William W. Hill, emigrated from England to North Carolina in 1687. The Hills are of Welsh descent.

Dr. Hill spent his childhood on a farm about four miles southeast of the city of Montgomery. After receiving tutoring by his father, he entered a private school in 1875 which was run by Professor George Thomas, in Montgomery. Then at 16 years of age, he entered Howard College, located at Marion, Alabama, but now at Birmingham, and attended two years, Oct. 1, 1878, to May, 1880. Dr. Hill was a corporal in Company A of the Student Army Training Corps while at Howard. He was listed among the distinguished undergraduates for the school year, 1879-1880, and received a certificate of distinction in English, Latin and Greek.

Young Hill was preparing for the ministry at Howard College and, no doubt, if it had not been for a rabbit and an old maid, would have followed the profession of his father and grandfather. In the summer of 1880, he and two other youths were visiting in Marengo County and as they entered a small town, they jumped a rabbit. One of the young men said, "Preacher, shoot that rabbit." Young Hill did shoot at the rabbit with a revolver and, although he did not hit it, a maiden lady had him arrested for carrying a concealed weapon and shooting on Sunday. His case was to come before the next grand jury so rather than be embarrassed by the whole affair and have his father learn the particulars, he obtained his father's consent to enter the study of medicine. With two years of academic work behind him, Dr. Hill went to New York City where he enrolled in the Medical Department of the University of the City of New York (later named New York University) in the fall of 1880, and his preceptor was Dr. W. J. Holt. He graduated with the M.D. degree on Mar. 10, 1881, at the ripe age of 19. While he was studying at the University of the City of New York, he qualified for certificates in two fields: certificate in private instruction in operative surgery and bandaging from Professor J. W. Wright and Professor Franz Heuel in 1880, and certificate from the Chemistry Department of the Medical Department of the University of the City of New York. Because of his youth, Dr. Hill chose to be examined by the Jefferson County Board rather than by the Montgomery County Board. He had hoped that no one on the Jefferson County Board would recognize him but he found, to his consternation, that the chairman of the Board, Dr. W. P. Taylor, had officiated at his birth. However, that did not influence the



DR. L. L. HILL, Montgomery, Ala.

results of the examination as he had feared, and he passed the Board on Apr. 12, 1881.

During the summer following his graduation, Dr. Hill attended lectures at different hospitals in New York City. Although he had a recognized medical degree, he was not satisfied with what he had learned, so he elected to do further study under one of the most prominent teachers and medical men of his time, Dr. Samuel D. Gross, Professor of Surgery at Jefferson Medical College of Philadelphia. On interviewing Dr. Gross, Dr. Hill found him quite skeptical when he informed Dr. Gross that he had graduated that spring at the Medical Department of the University of the City of New York. In fact, Dr. Gross requested Dr. Hill to present his diploma. This Dr. Hill did and entered Jefferson Medical College, where he received a second M.D. degree in the spring of 1882. The next year was spent at Wyeth's New York Polyclinic Medical School and Hospital, where Dr. Hill completed a course on the eye, ear, nose and throat and received a certificate dated 1883.

On Sept. 1, 1883, Dr. Hill boarded a ship at New York City for Liverpool and on the 16th of the month, matriculated at King's College Hospital, where he received instruction in surgery by Sir Joseph Lister. After graduating in March, 1884, he visited hospitals in the principal cities of Europe and finally returned to Montgomery, Alabama. It was in his home town that he began the practice of medicine on May 15, 1884, specializing in surgery. Strangely enough, although he had studied in many of the best known hospitals or had visited them, he had not seen an abdominal operation until he himself did one in Montgomery, Alabama.

A few years after Dr. Hill started to practice medicine, he was appointed Montgomery County physician to the Montgomery County Poor House at \$200.00 per annum. He immediately set about to clean up the poor house and, because of his success during the next few years, he won many professional friends.

In 1897, Dr. Hill became visiting surgeon of the Laura Hill Hospital of Montgomery, an institution named in honor of his mother and owned and operated by him and his brother, Dr. Robert S. Hill. For more than 35 years, these brothers were associated in the practice of surgery, Dr. Luther L. doing the general surgery and Dr. Robert S. the gynecology.

In 1902 Dr. Luther L. Hill reported the first successful case in America of suture of the heart for a stab wound penetrating the left ventricular cavity. It was not just an accident that Dr. Hill was called into consultation on the above case. He had been making a study of wounds of the heart and had published a paper, "Wounds

of the Heart With a Report of Seventeen Cases of Heart Suture," in 1900, two years before the above operation. Several other papers on suturing the heart were published by Dr. Hill during the next few years. Because of Dr. Hill's prominence in this subject, Dr. Albert H. Buck, Editor of the Reference Handbook of the Medical Sciences, wrote to Dr. Hill on Aug. 18, 1901, requesting him to contribute an article on "Wounds of the Heart" for the second edition of the above Handbook. Dr. Hill submitted the article and revised it for the third edition which appeared in 1915. The publisher had the following to say about the revised article which appeared in the fourth edition in 1923: "We are very glad to report that the article of Dr. L. L. Hill of Montgomery, Alabama, in the Third Edition was so highly thought of and received such favorable comment and is so nearly down to date at this time, that it has been copied intact into the Fourth Edition of the Handbook." In regard to the above quotation, it is interesting to note that a world war had been waged and that, with it all, Dr. Hill's article needed no major changes to keep it up to date.

Dr. Hill was elected to membership in the Montgomery Medical and Surgical Society (later named the Montgomery County Medical Society) in 1885 and, because of his ability and leadership, was elected president of the society in 1887, after only 2 years' membership in the organization. In 1888 he was elected a member of the Board of Censors of that society and held the office for the next 10 years. He was an official delegate from the society to the Medical Association of the State of Alabama in 1886 and 1887.

In 1887 Dr. Hill became a dues-paying member of the Medical Association of the State of Alabama. As in the case with the Montgomery Medical and Surgical Society, he took an active interest in the Medical Association of the State of Alabama. He was elected Junior Counsellor in 1889, Senior Counsellor in 1894, Grand Senior Counsellor in 1898, and Life Counsellor in 1908. On Apr. 23, 1897, at the Selma meeting of the Association, Dr. Hill was elected president. He presided at the Birmingham meeting of the Association and read the presidential address on Apr. 19, 1898. While he was president of the Association, he instituted the custom of giving the annual Jerome Cochran Lecture in honor of the distinguished pioneer health officer of the State of Alabama, and one of the leading organizers of the Medical Association of the State of Alabama. In 1913, Dr. Hill was honored by being requested to deliver the annual lecture and his subject was, "Surgical Complications and Sequels of Typhoid Fever." He was an official delegate from the Alabama State Medical Association to the American Medical Association from 1916 to 1918.

Dr. Hill attempted to enter the service during World War I but was declined because of deafness due to otosclerosis which was first noticed while he was a medical student. However, he did serve on the Montgomery County Board of Appeal during the first World War. Dr. Hill already had had considerable army experience, having been appointed surgeon of the Second Regiment of Alabama State Troops on May 30, 1888, by Thomas Seay, Governor of Alabama. He served with the rank of Captain of Infantry. And he was appointed Surgeon-General with the rank of Colonel on the General Staff of the Alabama National Guard on Mar. 10, 1911, by Governor Emmet O'Neal. He was commissioned on the following May 8 and served on the Governor's Staff.

From the time that Dr. Hill opened his office in 1884 until he retired at 70 years of age in 1932, he had a very active practice. His income usually varied between twelve and sixteen thousand dollars per year. As he grew older, he was very happy that he had not charged excessive fees. His largest fee was \$1,200.00, and in the late years of his life, he spoke of it with the greatest humility. It was with great pride that he referred to his extensive charity practice.

That Dr. Hill was a well trained physician and surgeon is evidenced by the variety of papers which he published in the leading medical and surgical journals. In addition to heart wounds and biography, he wrote on many subjects which included hernia, stone in the bladder, appendix, retention of the testicles, elephantiasis, smallpox, and cancer of the breast. His personal bibliography which includes twenty-six printed papers is appended. Almost an equal number of papers and addresses which Dr. Hill wrote to present at some public meeting or before some society, but which he apparently made no attempt to have published, have been assembled and bound in volumes 1 and 2 of "Papers and Letters of Dr. L. L. Hill."

Because of Dr. Hill's prominence in his profession, he was given recognition by local, state and national bodies. In 1893 he was elected president of the Montgomery County Board of Health. The Chief Clerk of the U. S. Pension Office appointed Dr. Hill a member of its "Board of Examining Surgeons" for Montgomery County, Alabama, and vicinity for two terms, 1896-1899 and 1902-1904. Dr. Hill served as president of the board in 1899. In 1911, he was appointed trustee of the Alabama School for the Deaf and Blind by Governor Emmet O'Neal and served through 1919. From 1915 to 1946, he served as surgeon for the Mobile and Ohio Railroad.

Because of Dr. Hill's broad training and success as a surgeon and his profound and scholarly writings, he became the recipient of many other honors. In 1910, the University of Alabama, in recognition of Dr. Hill's achievements as a surgeon, conferred upon him the degree of Doctor of Laws. In 1913 he was elected a fellow of the American College of Surgeons and in 1925 he was awarded a Phi Beta Kappa key by the chapter at the University of Alabama. Early in his career, he had been initiated as a "charter" member of the Iota Chapter of the Sigma Nu fraternity at Howard College on June 5, 1879, during the summer vacation between his freshman and sophomore college years.

His "Who's Who in America" sketch lists him as a Democrat and he was a firm believer in the Democratic way of life and the Democratic Party. During the 1930 campaign, the Alabama State Democratic Committee requested Dr. Hill to deliver a democratic address over the radio. He accepted the invitation and his address was so powerful that favorable comments came from all sections of the state.

The fields of surgery and medicine were well covered in Dr. Hill's private library. However, his classical education at Howard College was reflected in the other part of his library which had large sections on literature, history, biography and the sciences. His library, which was one of the largest in the community, furnished him a haven which he was accustomed to visit late in the evening after the rest of the family had retired.

As would be expected in the case of a great surgeon who was a "first," he carried on correspondence with some of the most renowned medical men of his day: Lister, Matas, Wyeth, Gorgas, Osler, Keen, J. M. Da Costa, and many others. Many of the letters have been bound together and preserved in the Hill collection.

For many years Dr. Hill was a member of the Social Medical Club of Montgomery which limited its membership to twelve local doctors. The club was unique, in that all meetings were dinner meetings at the homes of the respective members and the menu always began with oysters on the half shell. Dr. Hill was also a member of The Joie de Vie Club, the social club of Montgomery.

For diversion from his busy practice, Dr. Hill took up several sports. He was a member of the Montgomery County Shooting Club and his favorite hunting was for quail and doves. He did not entirely neglect the art of angling as he frequently brought home large catches of fine fish.

On the fifty-first anniversary of Dr. Hill's entrance into the medi-

cal profession, Nov. 21, 1932, eighty-three doctors of the Montgomery County Medical Society gave him a complimentary dinner and a loving cup as a testimonial to his long and fruitful service to humanity. A thirty-four page brochure includes the tributes by Dr. C. A. Thigpen and several other physicians, the acceptance speech by Dr. Hill and numerous letters which were received from other cities. At the suggestion of the president of the Alabama Medical Association in 1939, a second testimonial dinner was held for Dr. Hill on July 10, 1939, at which many out-of-town doctors attended. Dr. Lloyd Noland of Birmingham awarded the citation to Dr. Hill on this occasion.

Dr. Hill delivered the annual Gorgas Lecture on Oct. 3, 1933, before the Gorgas Medical Society, of the School of Medicine, University of Alabama, on the 79th anniversary of Gorgas' birth. He was initiated as an honorary fellow of the Gorgas Medical Society on the same day.

Dr. Hill was a man of large stature, being about 6 feet tall, and weighing from 250 to 280 pounds for the greater part of his adult life. His hair was light brown and his eyes were blue.

On July 12, 1888, Dr. Hill married Miss Lillie Lyons, of Mobile, Alabama. They were the parents of five children: Luther Leonidas Hill III, who died in infancy; Mrs. Lillian Hill Rucker, the wife of Dr. E. W. Rucker, an ear, nose and throat specialist of Birmingham; the Hon. Lister Hill, of Montgomery and Washington, D. C., who was named by his father for Sir Joseph Lister, was elected to the United States Congress at the early age of 28 years, and to the United States Senate in 1938, where he is still serving all of us; Mrs. Amelie Hill Laslie, the wife of Dr. C. G. Laslie of Montgomery; and Luther Lyons Hill, of Des Moines, Iowa, who graduating from the United States Military Academy at West Point in 1918 and serving in both World Wars, retired with the rank of Brigadier General to enter the business world.

After a long and fruitful career, Dr. Hill passed away quietly on Apr. 4, 1946, about fifteen months before the death of Mrs. Hill on Aug. 13, 1947.

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APPENDIX

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For full particulars write the Secretary, Dr. Thomas D. Moore, 899 Madison Avenue, Memphis 3, Tennessee. Essays must be in his hands before February 15, 1949.

